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Description

Bus coupling without plug connections for automation units

The present invention relates to a bus module for connecting an automation unit to a backplane bus which can be used to transport data and/or power, with said bus module having at least one bus connecting device for connection to the backplane bus and at least one unit connecting device - including a serial optical interface - for connection to the automation unit. In addition, the present invention relates to a load feeder apparatus which is intended to be coupled to a backplane bus and has an interface for communicating with a backplane bus module.

Backplane buses are used to couple decentralized peripherals to data buses such as a Profibus, ASI bus or CAN bus. The demands imposed on backplane buses are accordingly less than these on the latter buses.

A backplane bus module as illustrated in FIGURE 1 is usually used to connect an automation unit or actuator to a backplane bus. Connecting lines AL1 are tapped off the plurality of bus lines BL1 of the backplane bus module RM1. Said connecting lines each open into plug connection contacts (not illustrated). A bus connection or a load feeder VA1 is inserted into these plug connection contacts. Eight plug connections are required in the present example. Since the voltages and currents at the interface are small, correspondingly high demands must be imposed on the contacts. Only gold-plated contacts are therefore generally suitable.

Since a load feeder VA1 is usually relatively large and heavy, it should be possible to pivot the load feeder VA1 into the backplane bus module RM1 for more convenient

fitting. This operation of pivoting the load feeder may result in damage to the contacts if handled incorrectly, especially if the contacts are arranged, for example, in the small 2.54 mm grid. The contacts therefore need to be placed as far away from the pivoting shaft as possible so that the pins or sockets of the plug connections are not bent.

In the load feeder, the data received from the backplane bus module RM1 and the power provided by the bus need to be passed to a microcontroller µC1. To this end, DC isolation is required between the bus and the power supply (24 V). This isolation is usually implemented using five optocouplers OK which are driven by a bus ASIC BA1. The bus ASIC thus provides a serial interface having five lines. The optical coupling can be used to ensure isolation resistance for, for example, 500 V or 6 kV. The microcontroller is used to implement technology and control functions, for example drivers for contactor coils, a thermal motor model, diagnoses, soft starters and the like.

The object of the present invention is thus to propose a backplane bus coupling in which damage to the contacts can be avoided when connecting a load feeder.

According to the invention, this object is achieved by means of a bus module for connecting an automation unit to a backplane bus which can be used to transport data and/or power, with said bus module having at least one bus connecting device for connection to the backplane bus and at least one unit connecting device - including a serial optical interface - for connection to the automation unit, with the unit connecting device having a coupling element

which can be used to set up a point-to-point communication link to the automation unit.

In addition, the invention provides a corresponding load feeder apparatus which is intended to be coupled to a backplane bus and has an interface for communicating with a backplane bus module, with the interface being a serial optical interface.

The optical interface means that there is advantageously no need for a mechanical plug connection. Damage to the contacts can consequently also be avoided.

The optical interface results in DC isolation between a load feeder that is to be connected and the backplane bus module at the point at which they are connected. There is therefore no need for DC isolation within the load feeder.

The optical interface also increases the flexibility in terms of connecting load feeders. A plurality of load feeders may thus be supplied by one bus module, if necessary.

Since the optical interface always constitutes a defined electrical termination, undefined states do not result in the bus system if a load feeder is not connected. In particular, a load feeder which has not been plugged in does not result in the bus being interrupted.

The coupling element for setting up point-to-point communication preferably comprises a bus ASIC. This makes it possible to implement matched communication on a simple level in a very effective manner.

The unit connecting device of the backplane bus module may also have a microcontroller

which is connected to the coupling element and controls the serial optical interface. Optical communication can thus be managed flexibly.

The serial optical interface may comprise a UART interface. This standardized interface opens up a wide field of application.

In one alternative embodiment, the UART interface may be integrated directly in the coupling element, in particular the bus ASIC, so that no separate microcontroller is required.

The optical interface may also enable half-duplex or full-duplex operation. Depending on the individual circumstances, it is thus possible to set up a simpler or more complex connection to a load feeder.

The present invention is explained in more detail with reference to the attached drawings, in which:

FIGURE 1 shows a block diagram of a backplane bus coupling according to the prior art, and

FIGURE 2 shows a block diagram of a backplane bus coupling according to the present invention.

The exemplary embodiment described in more detail below represents one preferred embodiment of the present invention.

The backplane bus module RM2 according to the invention as shown in FIGURE 2 has increased functionality compared to the backplane bus module RM1 shown in FIGURE 1. A bus ASIC BA2 in the backplane bus module RM2 is directly connected to the connecting lines AL2 which represent branches from the bus lines BL2. The bus ASIC BA2 constitutes a simple communication link (point-to-point) to an optical interface

which is connected to said bus ASIC and is likewise accommodated in the backplane bus module RM2.

The optical interface comprises a microcontroller µC2 which itself operates an optics unit OE1 via an integrated UART interface. The optics unit OE1 is indicated symbolically by a transmitting diode and a light-sensitive receiving transistor. By way of example, transmission data TxD may thus be emitted using an infrared transmitting diode and received data RxD may be received using an IR light-sensitive transistor.

A load feeder module VA2 is placed at a suitable distance from the backplane bus module RM2. This distance must be selected in such a way that optical communication can take place in an unimpeded manner and, on the other hand, the requisite electrical isolation from voltages of 500 V or 6 kV is ensured.

The load feeder VA2 itself has an optics unit OE2 which is likewise symbolized in FIGURE 2 by a light-emitting diode and a light-sensitive transistor. Said optics unit OE2 optically is connected to the optics unit OE1 of the backplane bus module RM2. The DC isolation achieved thereby makes it possible, for example, for the load feeder VA2 to be reliably operated at a potential of 24 V.

The optics unit OE2 is driven by a further microcontroller µC3, likewise via a standardized UART interface. In this case too, the microcontroller µC3 undertakes technology functions such as driving contactor coils and carrying out diagnostic and soft starter functions.